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Optics for Luminescent Microscopy

This message is devoted to microscopy, in particular to development of optical systems of objectives for realization of specific researches on a microscope.

Development of a science and technical equipment leads to occurrence in microscopy of new kinds of researches, development of special devices for their realization.

In the given message questions of effect of a luminescence in microscopy which consists in ability of researched substances to let out radiation at influence on them external energy of excitation are considered. Radiation of a luminescence is characterized by spectral distribution of density of a radiant stream, an exit of a luminescence and some other characteristics. All these characteristics are caused by the nature of researched substance.

With reference to a classical luminescence the spectrum of stimulating radiation and a spectrum of a luminescence are connected by Stoks's law from which follows, that the spectrum of a luminescence and his maximum are displaced in more long-wave party concerning a spectrum of absorption. Tendencies of modern luminescent microscopy will consist in displacement of a stimulating spectrum in short area of a spectrum (230-260 nm).

At the same time the spectrum of a luminescence remains constant at any length of a wave of stimulating radiation.

Other tendency of modern luminescent microscopy is connected to a new method so-called non Stoks's law luminescence when the spectrum of a luminescence and his maximum are displaced in more short-wave party concerning a spectrum of absorption. For this case typically displacement of a stimulating spectrum in long area of a spectrum (800-1100 nm).

In the message questions of optical calculation and mechanical design of special quartz – fluorite microobjectives with the following characteristics (linear magnification/ numerical aperture) are examined:

2.5/0.03, 5/0.10, 10/0.20, 20/0.40, 40/0.65, 63/0.80, 100/0.90

(the note – objectives 2.5/0.03, 5/0.10, 10/0.20 takes the achromatic correction for a visible range of waves).

Newly developed objectives for microscopes are intended for the following methods of researches:

- For the registration of spectra of a luminescence of microobjects raised UV by radiation with length of a wave 254 nm and supervision of their luminescence in monochromatic light, allocated from a visible range of waves.
- For the registration of spectra of a luminescence of microobjects raised UV by radiation with length of a wave 365 nm and vision of their luminescence in a spectral visible range of waves. Newly developed, luminescent objectives are in addition used: 20/0.45, 40/0.65, 100/0.90.
- For registration of spectra of reflection of microobjects at illumination by radiation in a range from 350 up to 800 nm, and also monochromatic, with use of narrow-band filters in the specified spectral range.
- For registration of spectra of the luminescence raised by narrow-band infra-red radiation with lengths of waves 800-1100 nm.

In the message questions of optimum aberration correction of objectives for maintenance of their use with reference to various kinds of luminescent researches on a microscope are examined.

In the message questions of construction of original optical circuits new achromatic microobjectives for luminescent microscopy are examined.

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